CHAPTER - II
CONCEPTS AND REVIEW OF LITERATURE

A review of concepts used in past studies was made to define precisely the concepts relevant to the present study. It is also useful to have a review of past studies to gain better perspectives of the problem under study.

**Production:** The production has been defined as the gross value of the crop in money terms evaluated by converting the physical products into money values by multiplying yields by the respective prices in the reference year.

**Human labour:** Human labour has been defined in terms of total labour used on the apple plantation which was converted into man-days. The difference in the efficiency of labour has been taken into account by considering one man-day equivalent of one adult (18 years and above) working for 8 hours a day, and one man-day equivalent to two minors (less than 18 years) working for 8 hours a day. Three women days were considered equivalent to two man-days. It included family labour, permanent and hired labour.
Manure and Fertilizers: Expenditure on manure and fertilisers has been evaluated by multiplying the physical quantities of different manure and fertilisers used on the orchard by their respective prices.

Fungicides and Insecticides: Expenditure on fungicides and insecticides has been evaluated by multiplying the physical quantities of different fungicides and insecticides by their respective prices.

Fixed capital: Fixed capital includes annual depreciation on farm implements and machinery, farm buildings and interest in terms of money values.

Dummy variable: Dummy variable has been used to show the methods of sale since the data could be divided into two meaningful classes: (a) pre-harvest contractors and (b) Orchardists marketing their produce through other sources. Zero was assigned for the contract system and one for the other system of marketing adopted by the orchardists.

Management index: Management index was prepared on the basis of decisions regarding various operations which were identified as management factors. Those decisions were assigned weights on the basis of judgment of the subject matter. The decisions taken by different orchardists pertaining to
different operations on the orchard were ranked. These ranks were converted into scores using' Fisher and Yates j Table XX, which normalises the scores based on the ranks. A weighed sum of these scores for each orchardist was used as a management index.

Cost Structure

Farmers have to incur various kinds of costs for the purpose of producing different crops. There were cash costs and non-cash costs. Cash costs include out of pocket expenses such as wages paid to labours, expenditure on seeds, fertilizers, pesticides and others. Non-cash costs include interest on working capital and fixed capital, depreciation charges, rental value of land and others. Various authors use different cost concepts for different crops namely fixed and variable costs, direct and indirect costs, establishment costs and maintenance costs and others.

Perkins while investigating economics of coffee production in Kenya, classified the costs into

(a) essential maintenance costs which were incurred on cultivation, handling, pruning, spraying and shade maintenance and which were proportional to the total coffee acreage but independent of coffee yield,
(b) operational costs expended on green manure, cover chopping, mulching and comfort which were related to acreage and coffee yield indirectly,

(c) crop costs, incurred on picking and processing of which were proportional to the tonnage but independent on acreage and

(d) general overhead expenses incurred on general estate maintenance, tools, implements and management whose costs were usually constant and independent of yield.9

Farm expenses were classified into four types by Bradford and Johnson. They were (1) the items which were wholly used within the year, (These cash items included seed, feed, fertilizer etc.) (2) depreciation on properties, (3) decrease in inventories of operating capital, feed and supplies other than feed and (4) uses of the labour services performed by the members of the family other than operators.10

Wallis in his study on cost of production of coffee, classified the costs into (a) fixed costs, the expenses incurred in growing coffee, (b) crop costs,

the expenses incurred in harvesting, procuring, dispatching and marketing, (c) overhead costs which included the repair charges made on vehicles and equipment, the expenditure made on general transport and central services and (d) overhead expenditure relating to management, accountancy and rent.\textsuperscript{11}

**Shukla** has classified the costs into cost A\textsubscript{1} cost A\textsubscript{2}, cost B and cost C. Cost A\textsubscript{1} included all cash and hired expenses actually incurred less rent. Cost A\textsubscript{2} covered cost A\textsubscript{1} plus rent paid for the leased-in-land. Cost B included cost A\textsubscript{2} plus rental value of owned land plus interest on fixed capital minus lane revenue on owned land. Cost C covered cost B plus imported value of family labour.\textsuperscript{12}

According to **Sharma**, the cost of production included fixed and variable costs. The fixed costs comprised of expenses made on permanent human and animal labour, depreciation on farm implements and machineries, land revenue and cesses, rental value of land and interest on permanent investments other than land. The variable cost covered, wages


paid to hired human labour, cost of seed, manure and fertilizers, irrigation charges, betterment levy and miscellaneous costs such as plant protection charges, cost of gunny bags and interest on variable costs.\textsuperscript{13}

\textbf{Madappa} has divided the costs of production of coffee into cost of cultivation, costs of preparing the produce for market and other costs which included miscellaneous expenditure and depreciation.\textsuperscript{14}

The Directorate of Economics and Statistics categorized the costs into four types which are used in Farm Management Studies. They are:

1. \textbf{Cost A\textsubscript{1}}

Hired human labour, owned and hired bullock labour, machine power, seeds, manures and fertilizers, plant protection chemicals, depreciation on implements, machinery and farm buildings, land revenue, cess and water rates and interest on working capital.

\textsuperscript{13}A.C. Sharma, "Scale Economics in the Production of Farm Groups in the Cotton Belt of Punjab", Indian Journal of Agricultural Economics, 49(3): 283, 1969.

2. Cost A<sub>2</sub>

This refers to A<sub>1</sub> plus rental value of leased in-land. This is applied only for tenant-operated farms.

3. Cost B

It is cost A<sub>2</sub> plus interest on fixed capital excluding land and rental value of owned land.

4. Cost C

This refers to cost B plus imputed value of family labour.<sup>15</sup>

As per Johl and Kapur cost was the total amount of funds' used in production. They further divided the cost into cash and non-cash costs. Cash costs included the resources that are produced and used immediately in production process. The general cash costs are incurred while purchasing non-durable inputs like fertilizers, casual labour, and fuel oil which do not last more than one production period. Non-cash cost consisted of depreciation and payments to resources owned by the farmers, such as

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depreciation of tractors, equipment, buildings, payments made to management and interest for owned capital\textsuperscript{16}

**Barnard and Nix** have classified costs in farming into fixed and variable costs. Fixed cost is represented by farming expenses on an overhead nature and did not change with the level of output. Taxes, depreciation, cash, rent and interest payment formed the fixed cost.\textsuperscript{17}

**Kaboo** in his study on production and marketing of apple classified the costs into direct costs and indirect costs. The direct costs included maintenance and operational costs, repair charges of dead stock, land revenue and surcharge on bearing orchards and finally the expenditure on current year's intercrops. The indirect costs included the annual share of the establishment costs up to bearing, the interest and depreciation on fixed capital, working capital and interest on working expenditures.\textsuperscript{18}


\textsuperscript{17} C.S. Barnard and J.S. Nix, Farm Planning and Control, (Cambridge : Cambridge University Press, 1973), P.45.

Mckensis has classified the cost of cultivation of the crops into four categories based on forest activities, (1) establishment cost on levelling, planting and fencing, (2) maintenance cost which was the continuous inventory, (3) occasional costs like loss due to cyclone, fire and (4) final costs that is marketing of the full tree.19

With regard to forest plantation, Sivanandam has classified the cost into investment cost and establishment cost which included the opportunity cost on land, the cost of clearing the land, aligning and stacking, digging of pits, pandal erection, cost of seedling, cost of manuring, plant protection, watering, watching, intercultivation, clearing thorny growths and collection of nuts.20

Venkateswaralu et al., has divided the cost of production of grapes into five groups viz., expenditure on fixed assets, working assets, operating


asset of preparing period, pre-harvest and post-harvest charge of bearing years.\textsuperscript{21}

\textbf{Rao} defined cost $A_1$, as the expenditure incurred by the farmer in cash and kind, cost $A_2$ as cost A. plus rent paid for leased-in-land, cost $B$ of cost $A_2$ plus imputed rental value of owned land and interest on owned fixed capital (excluding land) and cost $C$ as imputed value of family labour added to cost $B$.\textsuperscript{22}

The costs used in the present study were variable cost and total cost. Variable cost was computed by adding the cost incurred towards seeds, manures and fertilizers, plant protection, human labour, bullo labour and interest on working capital. Total cost includes variable cost, rental value of land and taxes.\textsuperscript{23}


Land

Sadath All Khan in his study on coconuts had imputed the rental value of land equivalent to the interest amount on the market value of land, the interest rate charged at five per cent. Mohan has also adopted the same concept in his study on pepper.\(^{24}\)

The Directorate of Economics and Statistics has imputed rental value for owned land at the existing rate of rent prevailing for similar land in a village. In the case of leased-in-land the actual rent paid was taken. Rent paid in kind was valued at harvest prices.\(^{25}\)

In the present study all the sugarcane farms were owner operated. Therefore, the rental value prevalent in the adjoining area was adopted for completion purposes.

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Labour

Agarwal has recommended that for simplicity sake, in accounting procedure the family labour might be imputed at the permanent hired labourer's charges.\(^{26}\)

Panse combined all human labour, family as well as hired labour employed for different operations and estimated the labour cost at the prevailing wage rate.\(^{27}\)

Shangvi has measured the human labour in terms of man-day units of eight hours of work done by one adult man for the purpose of standardising the work units of different categories of labour viz., men, women and juvenile labourers, two women arid three juvenile each with eight hours of work were reckoned as one man-day unit.\(^{28}\)

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Sadath All Khan has treated permanent labour, family labour and hired labour alike and converted them into a common physical unit, viz., man-day equivalent.\(^{29}\)

Singh and Kahlon has also classified labour into family labour, hired labour and permanent labour.\(^{30}\)

Jayaraman in his study has valued the family labour at the wages paid to the permanent labour. For permanent and hired labour the actual payments made both in cash and kind were taken as the wage rate. Different categories of labour viz., female, male and juvenile labour were converted into man-day equivalent at the ratio of the average wages prevailing in the society.\(^{31}\)

Karana Loganathan has treated hired labour, permanent labour and family labour alike. The women and juvenile labour were standardised into

\(^{29}\) Sadath All Khan, op.cit., p.38.


man-day equivalent in proportion to their wage rates prevailing in the locality.\textsuperscript{32}

In the present study human labour is included with the family labour and hired labour inclusive of both casual and permanent labour employed for different operations in the field. All were treated alike and valued at the prevailing wage rate, for standardising the work units of different categories of labour, two women with eight hours of work were reckoned as the man-day unit.

**Bullock Labour**

Yang has estimated the cost of bullock labour at the rate of hiring charges prevailing in the village.\textsuperscript{33}

In the Farm Management study conducted by the **Directorate of Economics and Statistics**, has indicated ted the actual cost of maintaining a


\textsuperscript{33} W.Y. Yang, Methods of Farm Management Investigation, (Rome: Food and Agricultural Organization of United Nations, 1958).
bullock pair was divided by the number of working days for calculating the cost of bullock power per day.\textsuperscript{34}

In the present study the cost of bullock power was calculated at the rate of hiring charges prevailing in the locality.

**Seedling**

Patel has valued the farm produced seeds at the prevailing market price.\textsuperscript{35}

Pandey was in favour of valuing the farm produced seeds at the cost of producing the same.\textsuperscript{36}

Rajagopalan et al., valued the owned seeds at the village market rates and the purchased seeds as reported by the farmer.\textsuperscript{37}


\textsuperscript{35} P.C. Patel, Principles and Practices of Farm Costing with Farm Studies, (Bombay: Government Central press, 1933), p. 87.


\textsuperscript{37} V. Rajagopalan et al., op.cit., p. 3.
In the present study the farm produced seeds were valued at the market price prevailing in the locality and the purchased seeds were valued at the actual purchase price.

**Manures**

Agarwal has valued the farmyard manure produced at the farm at the prevailing market rate.\(^{38}\)

Rajagopalan, et al., has valued the farmyard manure at the village market rate.\(^{39}\)

In the present study the farm produced farmyard manure was valued at the market rate prevailing in that area at the time of its use and the purchased farmyard manure was valued at the actual cost plus transport cost.

In the present study fertilizers and pesticides and other plant protection chemicals were valued at the actual market price.

A study was conducted by Shukla and Pandey in Varnasi on the study of Costs and Returns of Sugarcane Farms in 1966-67.

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\(^{39}\) V. Rajagopalan et al., loc.cit.
The cost used by them for calculating total cost of production of sugarcane were human labour, bullock labour, seeds, manures and fertilizers, irrigation, rent, interest and upkeep of implements. According to their study the human labour cost formed the major cost item followed by seed costs in total cost of production. The per cent age share of manure and fertilizer was 14.60 and of bullock labour 14.08 in total cost of production of sugarcane. Irrigation cost formed 7.31 per cent and upkeep of implements formed 2.91 per cent in total cost of production. Rent and interest formed only 1.51 per cent and 1.16 per cent respectively in total cost of production of sugarcane.  

Rajagopalan et al., has conducted a study in 1978 on studies on cost of production of major crops in Tamil Nadu. The cost concepts used by them in the study were cost A and cost C. The cost A included the value of human labour including family labour, value of bullock labour, value of machinery charges, value of seed, value of insecticides and pesticides, value of manures and fertilizers, cost of irrigation and interest on working capital. Cost C includes cost A plus rent, interest on fixed capital excluding land, land revenue, cesses and taxes and depreciation of implements and machinery. From cost A, cost C was computed by assuming that cost A

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accounted for 70 per cent of the cost C. This assumption is in line with the results of the Farm Management and cost of cultivation schemes.

**According to the study in Tamil Nadu in 1976-77** the human labour cost formed the major cost component (33.17%) followed by fertilizer and manures (20.82%) in total cost A with regard to sugarcane planted crop. Irrigation cost formed 16.62 per cent in cost A. Seed materials cost formed 8.81 per cent and pesticides cost formed 6.56 per cent in cost A. Bullock labour cost formed only 2.98 per cent in cost A.

With regard to Tiruchirapalli district the study revealed that human labour cost accounted for the major share (34.18%) in cost A followed by manure and fertilizer (23.66%). Seed material cost accounted for 19.98 per cent and irrigation cost accounted for 11.93 per cent in cost A. Bullock labour cost formed only 2.30 per cent and pesticides cost formed only 1.36 per cent in cost A in the year 1976-77.⁴¹

A study was made by **Varadarajan in 1982-83** on Cost Price Relationship in Sugarcane in Tamil Nadu. He categorized the costs into

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variable cost, fixed cost and total cost. Variable cost included out of pocket expenses and imputed value of farm produced inputs.

Total value of depreciation and interest on the value of fixed assets of the farm constituted the fixed cost of the farm. Total cost includes both fixed cost and variable cost.

With regard to planted crop the total variable cost per hectare varied from Rs.11732.15/- in North Arcot to Rs.16187.75/- in Periyar district, the average being Rs.13441.54/- in the year 1981-82. In Tiruchirappalli district the total variable cost for sugarcane planted crop was Rs. 13316.40/- . The fixed cost range from Rs.1192.71/- per hectare in Madurai to Rs.3028.64/- in North Arcot and the average being Rs.2183.21/- for Tamil Nadu. In Tiruchirapalli district the fixed cost, for sugarcane planted crop was Rs.1661.47/-.

In the case of ratoon crop the variable cost per hectare varied between Rs.7659.40/- in Madurai and Rs.12019.59/- in Periyar district and the average for Tamil Nadu being Rs.9898.46/- . The amount fixed for
sugarcane ratoon crop was Rs.1354.26/- in Tiruchirapalli district, (Variable Cost Rs.10, 213.63).\(^{42}\)

Return

Gross Income

Forster has defined net farm income as the gross income including increase in inventory less the cash expenses, any decrease in inventories, and the depreciation capital.\(^ {43}\)

Shah and Singh have defined income of farmers as gross income inclusion of agricultural income from crop enterprises and non-agricultural income from the sale proceeds and rental value of irrigation requirement, machinery and non-agricultural income from services; shop-keeping and rents and shares elsewhere.\(^ {44}\)

\(^{42}\) Tamil Nadu Agricultural University, "Cost Price Relationship in Sugarcane", (Mimeographed Report), 1982-83, p.11.


Tandon and Dhondyal have computed the gross profit by deducting the total farm expenses incurred in producing the output from the total money income realised by the sales of the output.\textsuperscript{45}

Khare has included in farm income also the income from subsidiary occupation, wages and salaries and defined Income as the receipts net of operating expenses.\textsuperscript{46}

Annual farm income per family was defined by Singh as the income net of total variable cost which included the cost of seeds, fertilizers, plant protection chemicals, hired labour, water, fuel and electricity charges.\textsuperscript{47}

Herdt defined gross farm family income as income received by farm operators and was calculated as the residual after making actual payments for all expenditures incurred for production inputs, excluding any unpaid return to family owned resources (land, labour, or capital). In other words, gross farm family income equals total return minus paid out costs. The net


farm family income was calculated by subtracting depreciation from gross farm family income. It is a measurement of the income remaining with the family farm as a return to all the resources they own, adjusted to account for difference in capital endowments. By subtracting the land rent from net farm family income it was possible to compare the productivity of tenants and owner-operators.48

Sridharan in his study on Betalvine, has measured the gross income in terms of the value of total betalvines output realised and arrived at the net income by deducting the total cost. The total cost has included all the cash and kind expenses incurred in human and bullock labour power, seeds, manures, fertilizers, plant production chemicals, electricity charges depreciation interest on capital, land revenue and rental value of the land.49

In the present study gross income was defined as the total income obtained from the particular crop, both from main product and by-product.


Net Income

Miglani et al., has arrived at net income by deducting from the gross income costs which included expenditure on seeds, manures, labour, owned and hired, operating expenditure, and depreciation on irrigation structures, farm machinery and farm buildings., taxes, water rates and interest on working capital.\textsuperscript{50}

Waghanare and Marel defined the net income in the form of net profit or net loss, after deducting from the total income all expenditures such as paid cut costs both in kind and cash, depreciation charges, land rent, interest on capital and imputed charges on family labour.\textsuperscript{51}

Singh and Jha have defined net income of the farm as the gross income less variable costs of the farm business as a whole.\textsuperscript{52}

Shukla and Mlsra defined net income as the gross income minus total cost.\textsuperscript{53}


Dahiya in his study on land allocation patterns has realised net returns by deducting cash and kind expenditures (variable cost) incurred in the cultivation of crops during the year, from the gross produce (main produce and by-products evaluated at farm harvest prices).\(^5^4\)

Rajendran has defined net income of the farm the gross income less variable costs of farm business: as a whole.\(^5^5\)

Chinn has defined net farm income as gross farm receipts less total farm expenses.\(^5^6\)

In the present study two types of net income have been calculated. They were:

(1) Gross income minus variable cost and

(2) Gross income minus total cost


In the present study two types of input-output ratios were calculated. They were: (1) Input-output ratio with reference to the variable cost, the ratio between gross income and variable cost and (2) Input-output ratio with reference to total cost, i.e., the ratio between the gross income and total cost.

**Productivity**

_Sanghe has defined_ productivity as the ratio between output and input, both measured in real terms.57

_Saxon has defined_ productivity as the ratio of total output to all inputs inclusive of intermediate products.58

_Acharya has viewed_ productivity in terms of yield per hectare of land cultivated.59  _Ghouse defined_ productivity as the ratio of output to input which could be an indicator of the cumulated effects of economic activity.60

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Bhattacharjee has used the term productivity to denote the output per unit of input in farm business.\(^{61}\) Anbalagan has defined productivity as net output per unit - unit being hectare of land, or a man-day of labour or a rupee of Investment.\(^ {62}\) Singh has viewed productivity terms of yield per hectare of land cultivated.\(^{63}\) Korgaonkar viewed productivity as the ratio of output to input, the input being mainly capital, man and power.\(^{64}\) Pandya has viewed agricultural productivity as how far every unit of input will yield maximum output for every kilogram of improved variety of seeds sown, for every litre of irrigation water used, for every kilogram of fertilizer used, for every litre of herbicide used and insecticide applied.\(^{65}\)


According to Acharya and Nair, productivity was the contribution of all inputs; they are being continued in some composite portion.\textsuperscript{66}

According to Pandey gross income includes the value of crop produced as well as the value of their by-products whether sold, consumed or stocked. His study on costs and returns of sugarcane farms revealed the fact that gross income from sugarcane was Rs.3119.06/- per hectare in the year 1966-67 in Varanasi where the gross income from the cultivation of other crops was Rs.1372.28/- per hectare only.

Net income was calculated by him by deducting the expenditure incurred on human labour, bullock labour, seed, manures and fertilizers, irrigation, rent, interest and upkeep of implements from the gross income. The net income of sugarcane per hectare was Rs.2296.23/-whereas from other crops was only Rs.1027.39/-

The input-output ratio has been estimated in terms of proportionate output to input. The input-output ratio with regard to sugarcane was 3.79 whereas for other crops 3.79.\textsuperscript{67}

Rajagopalan et al. in his study defined gross income as the income which includes the value of the main product and the value of the by-product. The gross income from the cultivation of sugarcane was Rs. 10266/- per hectare in Tamil Nadu (average) in the year 1976-77. In Tiruchirapalli district the gross income from sugarcane in that year was Rs. 11174.60/- per hectare.

There are two types of net return i.e., net return over variable cost and net return over cost C were calculated by Rajagopalan et al., in their study. Net return over cost A for Tamil Nadu was Rs.3358.90/- per hectare for sugarcane in 1976-77. Net return over cost C was Rs.1143.31/-. In Tiruchirapalli district the net return over cost A was Rs.4641.14/- per hectare and net return over cost C was Rs.1841.08/- per hectare for sugarcane in 1976-77.

The input-output ratio was defined as the ratio between gross income and the cost A in the study made by Rajagopalan et al. The input-output

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ratio in Tamil Nadu for sugarcane in the year 1976-77 was 1.49 and in Tiruchirapalli district 1.71.  

**Yield Gap**

Productivity or yield per acre is not same in all farms and in all places due to many reasons and there lies the productivity gap or yield gap. This yield gap is defined in different ways by different authors.

Davidson and Martin made a study of the relationship between yields on farm and experiment station in Australia for a number of crops. They arrived at the conclusion that the gap between farm yields and experimental yields varied according to the growing seasons. In good years the yield at experiment station increased more rapidly than the yields of farms in the same district. The reason lies in the fact that farmers were limited in their input investment by the desire to maximize profit, while the experiment station with little or no cost constraint attempted to maximize yield.  

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68 V. Rajagopalan et al. op.cit.

Yield gap is defined by Herdt and Wiekham as the difference between the yield potential at experiment station during the dry season in a good year and the average national yield. They divided the gap into year to year variation, seasonal effects (dry and wet), water control, economic constraints, lack of availability of inputs and non-adoption of technology. 

**T.K Pal from his study** has concluded that the main constraints to yield were the difficulties in obtaining seed, chemical fertilizers and pesticides, production credit and inadequate irrigation facilities.

**Sharma has** also got the similar results from his study on changes in rice farming in Varanasi district of Uttar Pradesh.

**According to Evenson** the introduction of new technology created a yield gap which he called as 'Economic Slack'. Economic slack is the difference between the present product of a factor and the product that could

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70 R.W. Herdt and T. Wiekham, "Exploring the Gap between Potential and Actual Rice Yields in Philippines", Food Research Institute Studies, 16(2): 163-181, 1975


be realized if all the resources were optimally utilised. Research activities produced slack and it was reduced by such factors as expansion of extension activities and improvement in rural infrastructure. The incentives for such changes come from access to more productive technology. He pointed out that such changes, however, did not occur immediately and it was the delay or constraint to the process of changes that materialize in a gap between actual and potential yield in the farmer's yield.

According to Gomez the yield gap can be divided into the components viz., yield gap I and yield gap II. Yield gap I was the difference between experiment station yield and potential farm yield (yield obtainable in farmer's field by adopting improved technology) and yield gap II was the difference between potential farm yield and actual farm yield. Yield gap I was hypothesised as caused by either environmental difference between experiment stations and farmer's field or by non-transfer of technology. Yield gap II was caused by biological and socioeconomic constraints. Biological constraints referred to the uncontrollable natural factors like soil fertility, rain fall, pest and diseases. Socioeconomic constraints referred to the social and economic conditions that prevent farmers from using the recommended technology. The socioeconomic constraints were the attitude
and knowledge level of the farmers, cost and returns, credit institutions and input availability.\textsuperscript{73}

Experiments were conducted by Gunasena \textit{et al.} on farmer's field in Giritale of Sri Lanka to identify the yield gap and factors responsible for it. They identified that non-adoption of recommended dose of fertilizer, weed control and insect control were the major yield constraints in rice and the major reasons attributed for, not following the recommended practices were lack of technical knowledge and financial problems.\textsuperscript{74}

Yield gap is defined by Mukerji as the ratio between the potential yield as found in the National Demonstrations in a given state and average state yield.\textsuperscript{75}


\textsuperscript{75} D.K. Mukerji, “Gap Analysis - An Effective Production increase Concept in Rice” , Summary of Lecture delivered at the State Level Training on Rice Technology held at Purilia, Department of Agriculture, West Bengal, India, 1977.
A study was done by Radhakrlshnan to find out the constraints to productivity in cotton in Tirunelveli district of Tamil Nadu and found the fact that the yield gap was due to non-adaptation of high yielding varieties and inadequate resource base of the farmers. 76

According to Barua et al., the productivity gap in potato in Megalaya was mainly due to use of traditional varieties and low fertilizer and pesticide use.77

According to Singh the uncertain production trends, inadequate credit facilities for ratoons, continuance of old varieties and lack of technology transfer were the major constraints in increasing the production and productivity of sugarcane.78

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76 G. Radhakrlshnan, “Constraints to Potential Productivity in Cotton In Koilpatti Block, Tirunelveli District, Tamil Nadu”, (Unpublished M.Sc.(Ag), Dissertation submitted to the Department of Agricultural Economics, Tamil Nadu Agricultural University, Madurai 1981).


Vaishnav from his study has found that increased agricultural production required further investments in irrigation, power, land reclamation and seed multiplication.\textsuperscript{79}

Yield gap was conceptualised by Chandrasekaran as gap I and gap II in his study. The yield gap I was the difference in yield between the research station yield and the potential yield in farmer's fields as estimated from the demonstrations and the yield gap II was the difference in yield between the potential yield realized in the demonstration plot and the average farm yield from the sugarcane crop.

His study revealed the fact that in the year 1983-84, in the sample farms of Avinashi taluk of Coimbatore district the gap I and II was observed to be 45.42 MT and 28.32 MT per acre respectively. The gap I was due to the non-transferable technology and environmental difference between "the research station and demonstration plots. The gap II was due to biological, socio-economic and technical constraints which were responsible for the deviation in the adoption of recommended levels of new technology.

This gap would be narrowed down by reviewing the socio-economic and technical barriers constraining the adoption of technology in the farms.\textsuperscript{80}

In the present study the yield gap was defined as the gap between the Progressive Farmer’s yield (potential yield) and the actual average farm yield.

**Agricultural Credit Needs**

Agricultural credit is needed for different purposes. There were different studies in the past which stated the purposes for which agricultural credit was needed by the farmers. For instance, Rangnekar expressed the view that the Indian peasantry sunk in poverty, had to resort to eke-out a living from agriculture based subsistence farming.\textsuperscript{81}

**Bhargava and Shah** were of the view that the credit needs of the farmers consists of credit for fertilizer, hired labour expenses, pump sets, land reclamation and machinery and agricultural equipments. They have also


\textsuperscript{81} D.K. Rangnekar, Agricultural Finance in India. (Bombay: Co-operators Book Depot, 1952), p. 48.
pointed out that adoption of new technology is capital intensive in nature which leads to manifold increase in credit demand.\textsuperscript{82}

**According to Chowdhury** the credit requirement of farmers was of the different type and for different purposes. They are seasonal credit need for meeting the various input requirements like seed, fertilizer and pesticide, medium-term credit requirement for purchase of seed drill, sprayer, etc., and long-term credit for land leveling and construction of cattle shed etc.\textsuperscript{83}

**Sharma and Prasad** had the opinion that in terms of per centage, credit needs of the improved technology are 195 per cent higher than the credit need at the current technology. The credit needs increased about three times on the irrigated farms than those of unirrigated farms. Again they reported that in coming years the production credit needs are expected to grow at a faster rate in relatively progressive area than in less progressive area.\textsuperscript{84}


As per the estimation of Shah and Dutta, the additional finance requirement if or switching over to new technology for the farm operating a hectare of land as short-term in Goalpara District of Assam was Rs.500.\(^85\)

The credit needs by regions for different stages of technological development in U.P agriculture was worked out by Pandey. He found that in Varanasi, the credit needs were, on an average about Rs.258/- per hectare at the existing state of technology as compared to about Rs.739/- at the improved level of technology while in Doorie, these needs were assessed at Rs.312/- and Rs.715/- per hectare at these stages of technology respectively.\(^86\)

**According to Shankar and Srivastava**, the credit needs of sample high yielding variety paddy growers (1973-74) on an average works out to


Rs. 4000/- and those of traditional varieties of paddy growers come to Rs.3489.\textsuperscript{87}

**Credit Needs met by the Farmers through Various Sources**

Fanners are getting financial assistance from different sources namely nationalised banks, co-operatives, money lenders, friends and relatives. \textbf{Rajagopalan has said} that the supply of credit will depend upon the level of saving and capital formation, degree of risks and uncertainties in lending and perspectives of financial institutions. He stated that the institutional credit is traditionally provided by the co-operatives and government. The share of other institutions is negligible. Unlimited liabilities in the co-operatives and extreme caution and complicated procedures in government and responsibility of financial institution for their depositors had made the supply of credit as asset oriented or liquidity based and not as need based, consequently, the supply of credit by institutions is very much limited and the individual money lender dominates the agrarian society.\textsuperscript{88}


According to Singh, the co-operative societies are the major source of finance for medium and large farms. Indigenous sources such as local money-lenders, neighbours and relatives dominate the credit supply to the small farmers. The obvious reasons are the easy accessibility of farmers to indigenous sources of credit and their present small credit worthy financial assets, which remain an obstacle for procuring credit from other sources.\(^89\)

The study made by Gunasekaran has revealed the sources of borrowing of the farmers in the study block (Kuttalam and Kumbakonam) in Tanjore district. Ko has observed that the per centage of borrowing through cooperative societies was more than other sources in the study blocks. The per centage of borrowing through government, co-operative societies, commercial banks and money lenders were 19.4, 55.9, 7.5 and 17.2 per cent respectively in Kuttalam block and 10.1, 53.6, 5.7 and 30.6 per cent respectively in Kumbakonam block.\(^90\)

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Credit Needs met by Co-operatives

According to All India Rural Credit Survey Report, the co-operatives have met only 3.1 per cent of the credit needs of the farmers.\(^9^1\)

As per the report of Desai and Naik, the amount borrowed per acre from co-operatives by the growers of high yielding varieties ranged from two to 32 per cent of the scale of finance per acre fixed for the respective crops.\(^9^2\)

Athavale et al., has observed that on the selected farms co-operative credit contributed to 30.22 per cent of the current farm expenditure in Raipur district and 59.31 per cent in Tikangarh district. The proportion of loan disbursed to the calculated requirement was only 6.26 per cent in Raipur district and it was 54.46 per cent in Tikamgarh district.\(^9^3\)

Chowbey has stated that the co-operative society has advanced loans as short and medium term approximately to the tune of Rs. 9790 in 1975-76


as compared to Rs.229 in 1951-52. From a mere 3.1 per cent in 1951, the share of co-operative credit has increased to about the 40 per cent of the total requirements in 1975-76.\textsuperscript{94}

The RBI reported that during the year 1975-76 credit limits sanctioned by the bank for agricultural operation to state co-operative banks increased to Rs.612 crores from 419 crores in 1974-75. The increase in the short-term credit limits may be attributed mainly to the increased demand for fertilizers and other inputs in both kharif and rabi season in 1975-76.\textsuperscript{95}

**Srinivasan has defined** the credit gap as the difference between the credit needs and the credit supplied.

A study was conducted by **Srinivasan in Dindigul and Nilakkottai areas of Madurai district in 1982-83.** His study revealed the fact that the credit supply in the survey area for all the sample farmers owning a total of 117.45 acres of land comes to Rs.10,427.67/- per acre on an average. From the samples it is estimated that the establishment expenditure was to the tune of Rs. 15,711.07/-. The credit gap of Rs. 5,283.40/- was the difference


\textsuperscript{95} RBI, Annual Report and Trend, Progress of Barring in India, 1975-76, 1976, p. 72.
between the credit needs and the credit supplied. The farmers had to fill up the gap of credit to the extent of 33.63 per cent from their own funds.

In the present study the credit gap was defined as the gap between the credit available through Nationalized Commercial Banks and the Co-operative Society and the credit requirement by the farmers.\textsuperscript{96}

**Production Function**

The term production function is defined by Heady and Dhillon as the relationship between the input of the factor services and output of the product.\textsuperscript{97}

Production function was fitted by Heady for a random sample of 738 farms in Iowa, and it was the best empirical estimates of production function for agricultural farms in U.S.A. Inputs were land, labour, power and equipment, livestock and feed and operating expenses all measured in dollars. Output was measured in dollar value of produce.\textsuperscript{98}


Cobb-Douglas production function was employed by Singh and Garg to study the resource-use efficiency of the sample farms in two districts of North-Western U.P. in the year 1967-68. The findings of the study indicated that the ratio of productivities to the input costs of land and bullock labour were statistically greater than unity which indicated that there would be scope for increasing the farm productivity through further use of those resources in increasing the existing level of use and by reallocating the existing level of use and by reallocating the level of some resources used in the farm.99

Production function of Cobb-Douglas form was used by Shankayan and Sirohi to measure productivity of various agricultural resources in the seed potato farms and to examine the possibilities of increasing the returns by reallocation of existing resources. They found constant return to scale in seed potato enterprises and decreasing return to scale in maize enterprise. For all inputs except land, the ratios of their marginal productivities to their

respective prices were not significantly away from one indicating the near optimality conditions of the farmers.\textsuperscript{100}

A study was made by \textbf{Singh and Pandey} with regard to the cropping pattern in Uttar Pradesh they examined the resource use efficiency in the dry farming areas of Banda district, Uttar Pradesh. They estimated marginal value productivity of different resources to their respective marginal costs and found out the resources use efficiency. They got the conclusion that human labour was used more efficiently.\textsuperscript{101}

\textbf{Cobb-Douglas} type of production function was fitted by Aiyasamy to study the resource use efficiency of sugarcane farms and found that land, fertilizer and capital to be significant and all other factors were non-significant.\textsuperscript{102}


\textsuperscript{102} P.K. Aiyasamy, “Studies on the Production Cost and Resources Efficiency in the Sugarcane Farms of Coimbatore South”, (Dissertation submitted to the University of Madras for the award of M.Sc.(Ag), Agricultural Economics, 1964), pp. 69-70.
Varadarajan has found that among the variable inputs for the production of jaggery/sugarcane; land, labour and fertilizer were found to have significant influence on yield of sugarcane and all other input factors were found to have an insignificant influence go on yield.\textsuperscript{103}

Santhayan and Sirohi have found that there existed possibility of increasing the return by reallocation of existing resources.\textsuperscript{104}

Functional analysis used by Palanisamy in the study of economics of production and marketing of grapes revealed that the level of irrigation and manures and fertilizers had influence on the production of grapes.\textsuperscript{105}

In the present study production function was defined as the relationship between the inputs and outputs.

\textsuperscript{103} S. Varadarajan, “A Study of the Production Costs and Resources Efficiency In Sugarcane Farms in Coimbatore Taluk”, (Dissertation submitted to the A.C. and R.I. Coimbatore for the Award of M.Sc.(Ag), 1968), p. 84.


\textsuperscript{105} A. Palanisamy, “A study on Economics of Production and Marketing of Grapes in Dindigal Division” (Unpublished M.Sc., (Ag), Dissertation submitted to Tamil Nadu Agricultural University, Coimbatore, 1975)

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Consumption of sugar and sugar preserves have declined by 19 and 144 per cent respectively between 1958 and 1972 for sugar this trend will continue with consumption down by one-third but with confectionary consumption up by 2 per cent by 1978 in comparison with 1972 figures. Both products respond slightly to changes in prices with elasticity of 0.3 and 0.18 respectively.\textsuperscript{106}

Sugarcane is the nature of India which is a major produce of sugarcane and sugar in the world. Other important sugarcane producing countries include Brazil, Cuba, Pakistan, Thailanth, Philippines, Argentina, Colombia, Indonesia, South Africa and Egypt. Sugarcane production is 11926 m.t. in India. sugar Industry is one the largest processing industries, next to cotton textiles. There are 414 sugar mills, in India and, the sugar output is at 239 m.t. production of can has increased from a low level of 57% m.t in 1950-51 to 241.0 m.t in 1990-91 currently cane production is at 282.9 m.t between 1950-51 and 1994-95 the area under sugarcane recorded a compound growth rate of 1.81 % yield by 1.19% and production by 3.01 per annum. The contribution of area in increasing the output was more than productivity.

Macro paedia sugarcane is a perennial grass of the genus saccharum most of present-day commercial crops are the off springs or hybrids of the species saccharum officinarum which was developed form a wild cane species saccharum robustum and cultivated by natives of southern pacific islands.107

The new caption is any of several of the simpler carbohydrates which are soluble in water have a sweet taste. All the sugars consist solely of carbon and the elements of water (H₂O). The sugars which are not resolved into simple carbohydrates by hydrolysis are called monosaccharide.

These include the pentoses (with the empirical formula (C₅H₁₀O₅) and the hexoses (C₆H₁₂O₆) common sugars among the hexoses are grape sugar or glucose and fruit sugar or fructose. All the sugar are optically active in solution so that glucose is also called 'dextrose' because it rotates polarized light to the right and fructose is also called laevulose' because it rotates polarized light to the left.

Sugar from both sugarcane and sugar beet containing from 90% and 98% sucrose and 99.9% after refining pure cane sugar separates out from an

aqueous solution As 'nearly colourless monoclinic, prismatic crystals with a meeting-point of 160°C when formed slowly on threads suspended in the solution. They grow very large and constitute 'sugar candy'. If cane sugar is heated with a little water until it melts and begins to turn yellow it sets on cooling barely sugar' heated above its melting point past the yellowing stage cane sugar turns brown and forms 'caramel' a semi-solid amorphous substance used in confectionary and for colouring drinks. 108

**Barand and mix** have classified in farming into fixed and variable costs. Fixed costs represented forming expensed on an overhead nature and did not change with the level of output taxes. Depreciation cash rent and interest payment formed the fixed. 109

**L.T. Wallace** refined sugar consumption has been steadily at about 100 pounds for 50 years over. The years there has been a slow but a steady decline in the proportion of sugar delivered in consumer size packages this mealy that people are consuming and increasing proportion of sugar in processed food products. 110

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On the average each person in the United States uses about 94 pounds (43 kilograms) of sugar a year - many nutritionist, dentists and physicians feet that people us to much a large. They claim that eating excessive amounts of sugar contributes to such health problems as tooth decay and overweight.

Sugar is solid or liquid substance that is white or colourless when it is pure. It is distributed to Industrial and home users in several forms.\textsuperscript{111}

\textbf{Ravindra Thakur et al.(1989)} in his field study, "correlation and regression studies on yield and quantity parameters as affected by nitrogen level in sugarcane" based on six sugarcane varieties belonging to different maturity groups shows that the yield and its attributes responded positively and significantly with increasing nitrogen doses.\textsuperscript{112}

\textbf{Sharma et al. (1990)} has carried out a study "Dynamics of sugarcane reduction in vindhyaplatnu of Madhya Pradesh". The study shows that sugarcane area and productively decreased. It also stressed the need for improved technology, better extension techniques; introduction of low cost


technology and over and above there must be increased irrigation facilities.  

**Mohammed salim (1986)** sugarcane is one of the most important food cum cash crops (sign, 1971, Parthasarathy, 1972) white sugar, brown (khand sari) and jaggery (gur) are that major sweetening agents in India. In 1976-77, that total area used for sugarcane crop in India was 2872.4 hectares, which was 74.3 per cent of the total irrigated area. The total production was 15836.6 tonnes and the total yield per hectare, was 5513kg. In Uttar Pradesh, the total area under sugarcane crop was 1490.6 hectares which was 69.8 per cent of the total irrigated area. The total production was 6810.9 tonnes and the per hectare yield was 5569kg (Government of India, 1972, Vol 1782-85). In Uttar Pradesh, Bihar, Haryana and Punjab besides food crops sugar cane is the major cash crop, sugarcane factories are next to the textile industries in India and provide gainful employment to a large number of people.  

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Government (1994-95) production of sugarcane an upwardly forwarded since 1985-86 until it peaked at 254 million tonnes in 1991-1992 in 1992-1993 it declined to 228 million tonnes mainly due to a decline in area from 3.8 million hectares in 1991-92 to 3.6 million hectares in 1992-93. In 1993-94, production is estimated at around 227 million tonnes which was lower than 1992-93 by 1 million tonnes. In 1994-95, 245.6 million tonnes. In 1994-95, 245.6 million tonnes of cane output is a distinct possibility; Maharastra Karnataka and Tamil Nadu are reported to have higher cane output this year compared to last year.115

**D.C. Pande (1998)** has India embarked upon the developmental planning in 1951 with a serious of insufficient food supply for the masses population census data reveal that between 1901 and 1951 India's population rose by a huge proportion of 36 per cent. While doing the same period increase in cultivated area was only 18 per cent average productivity for all crops way 13 per cent and increase in the food grain crops was more one per cent.

**B.V. Mantani, K.L. Purthi:** National Co-operative Development Corporation (NCDC) is promoting establishment and development of sugar

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factories in the cooperative sector with the basic objective of ensuring remunerative prices to sugarcane growers. While NCDC provides term loan assistance to the existing cooperative sugar factories for modernization-cum-expansion in their installed capacity and for establishment of sugar by-product units, its assistance to new cooperative sugar factories is restricted to providing investment loan assistance to the State Government for the participation in the share capital of new mills. Sugar technology mission has recommended (many new technologies that need to be evolved successfully and made commercial viable like; efficient cane separation system, low pressures milling, Alteration and syrup clarification film type sulphur burner, short retention, clarifier, membrane treatment of juices, NIR Technique online auto pan boiling and PTH scale prevention etc.\textsuperscript{116}

Agriculture export global sugar production for 2006-07 is forecast to increase to 155.5 million tonnes, due to higher output in the developing countries such as Thailand. Sugar production in developed countries is expected to drop by 9.1% in 2006-07 to 39.1 million tonnes, output in the EV for 2006-07 is estimated to have decreased by 23% from 21.4 million tonnes in, 2005-06 to 16.5 million tonnes in 2006-07 reflecting adjustments under

\textsuperscript{116} B.V. Mamtani K.L. Pruthi "Promotion of sugar cooperative NCDC's Role", Dy-Director (Sugar), NCDC, New Delhi, 2005-06, pp.20-21.
EV sugar policy reform, world sugar consumption in 2006-07 is anticipated at 152.1 million tonnes a 1.5% growth from 149.9 million tonnes in 2005-06.\textsuperscript{117}

\textbf{Jitendra singh et al.,} India is the largest consumer of sugar in the world at present. India is also larger producer of sugarcane. In the world, Brazil, contributes about 13.25 per cent of the world’s production of sugarcane in the country is around 234.5 million tonnes, sugarcane is cultivated more than 4 million hectares in the country.\textsuperscript{118}

\textsuperscript{117} Agri export advantage, vol.6, 2007 January, p.7.

\textsuperscript{118} Jitendra singh, Krukshtetra, Vol.55, (July 2007, P.24).
CHAPTER - III

PROFILE OF THE STUDY AREA

Karur taluk, which was once a part of Coimbatore district, was merged with Tiruchirappalli district during 1910. A separate Karur district was formed on 30th September 1995 by trifurcating Tiruchirappalli district. Initially, Karur District was carved out of the composite Tiruchirappalli District, consisting of three taluks namely, Karur, Kulithalai and Manaparai. Subsequently Manaparai taluk was decoupled and Musiri taluk was included in Karur District. Later Musiri taluk was decoupled from Karur District. Karur District, with headquarters at Karur, is the most centrally located district of Tamil Nadu. It’s about 371 km south west of Chennai (Madras), the capital of Tamil Nadu. Karur district is bounded by Namakkal District in the north, Dindigul District in the south, Tiruchirappalli District on the east and Erode District on the west. Karur district was formed through Government Order 913 dated 30.10.1995.

One of the ancient cities in Tamil Nadu, Karur was ruled by the Cheras, Cholas, the Naickers, and the British successively. There is proof that Karur may have been the centre for old jewelry-making and gem cutting (with the gold imported mainly from Rome), as seen from various